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UNITED STATES GRADES FOR TIMOTHY HAY, CLOVER HAY, CLOVER MIXED HAY, AND GRASS MIXED HAY

Effective February 1, 1924

Including an Outline of Haymaking, Baling, and Loading Methods Essential to the Marketing of High Grade Hay

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EARLY WORK ON HAY STANDARDIZATION

Hay is one of the four major field crops of the United States. In recent years its annual farm value has been outranked only by corn and cotton and in some years only by corn. In many States, such as New York, Pennsylvania, Michigan, Wisconsin, Colorado, Idaho, New Mexico, and California it is the leading crop in total farm value and is also of large importance to farmers as a cash or market crop. In 1923 the total production of cultivated and wild hay in the United States amounted to approximately 106,626,000 tons, having an estimated farm value of $1,390,967,000. Approximately 15,993,900 tons of hay, or 15 per cent of the total crop in 1923, having a farm value of at least $196,565,000, entered the hay commerce of the United States. Hay trade statistics show that in 1923 about 6,628,472 tons of hay originated at railway shipping points for transportation to various markets. This portion of the 1923 hay crop had a destination value of $125,000,000 to $150,000,000.

HAY COMMERCE UNSTANDARDIZED COMPARED WITH CORN, COTTON, AND WHEAT

From the statistics stated it is seen that hay occupies a position of great importance in the agriculture of the United States, and that it is a staple product occupying a relatively high position in

national commerce. Notwithstanding its ranking position, hay has received less attention, with respect to standardization of the product and marketing methods, than other crops of major importance, such as corn, cotton, and wheat. Within the last 10 years the standardization of commerce in these three products has made great progress, until to-day their trading standards are well nigh universal throughout the United States and are largely employed in the export trade. Such trading terms as No. 2 Yellow Corn, Middling Cotton, and No. 2 Red Winter Wheat are commonly employed by and are well known to the producers, shippers, brokers, and consumers of these products in all domestic and foreign markets.

By comparison with the standardized trade and commerce in other major agricultural products, the national commerce in hay is almost chaotic. Uniform standards of quality or grades for timothy, clover, alfalfa, and other important hay crops have not been commonly employed throughout the hay markets of the United States. For example, No. 1 Timothy, No. 2 Clover, and No. 1 Alfalfa are terms commonly employed in the hay trade, but heretofore these terms did not define commodities of identical, or nearly identical, quality to all men and all markets. These terms, as heretofore used, were variously interpreted and applied and did not define nor prescribe definite commodity standards. In many communities and markets no grades have been employed for defining quality as between buyer and seller. Under such conditions contracts were difficult to enforce and the marketing of hay was often risky business. In other instances grades have been devised which had some merit locally, but which had little recognition in other communities. Whenever such local grades have been formulated and applied by hay-receiving organizations the final outcome frequently has been a complaint from producers and shippers that such grades favor the buyer and discriminate against the shipper.

Standardization in hay grading and marketing has never been realized in the United States to any appreciable extent. Important pioneer work in hay standardization has been done by the National Hay Association and by other trade and State organizations, but the standards formulated by such organizations have never become national in scope nor usage. The objectives have been visualized and defined, but are as yet unattained. All far-sighted men who have knowledge of hay production and marketing realize the genuine benefits that would accrue to the hay trade of the United States through national standardization of this staple product. The fact that trade is hampered by a variance in standards and facilitated by a uniformity of standards admits of no serious argument.

THE PROBLEM OF MEASURING HAY QUALITY

Problems in hay standardization are by no means simple or easy of solution. In comparison with grain standardization it may be said that hay standardization is difficult. Hay as a commodity can not be tested and graded in a rapid manner by any of the mechanical methods such as those available for grain. Foreign material and damaged portions can not be separated readily nor can moisture and accurate nutritive value tests be applied quickly to samples. Hay is bulky, its component parts impractical of quick separation, and its

quality and relative feed value can be measured only by those characters and factors which are visible and which are correlated with intrinsic value.

Until recent years no serious attempt has been made to study hay for the purpose of determining and defining its visible physical characters which would measure its real value approximately as a merchantable commodity. From time to time opinions have been voiced that standard grades of hay are difficult if not impossible to secure because of the bulkiness of the commodity and the impossibility of measuring value by mechanical methods. As a result such grades as were devised were too often founded on generalities. The definitions were not sufficiently explicit, and the interpretation of the standards was left too often to the judgment of the inspector.

HAY STANDARDS INVESTIGATIONS ORGANIZED BY THE DEPARTMENT OF AGRICULTURE

The Bureau of Agricultural Economics, United States Department of Agriculture, has recognized the need for standardized

FIG. 1.—Examining baled samples of timothy and clover hay in the laboratories of the Department of Agriculture. The United States grades were formulated from many samples obtained in many markets and are based on careful analyses for color, percentages of foreign material, and mixtures of various kinds of hay with timothy.

grading methods in the hay business of the United States, and with a desire to render a genuine public service to producers, shippers, brokers, and buyers, it organized investigational work regarding standards for timothy and clover hay. Detailed investigations with respect to color and foreign material as hay-grading factors and with respect to mixtures commonly found in the producing areas, have been carried out in Government warehouses and laboratories in recent years. (See fig. 1.) Thousands of baled hay samples have been assembled from many markets and shipping points for examination and study. Painstaking methods have been followed to determine the value of color as a measure of quality and to determine definitions for

expressing relative quality in terms of color. Many bales have been carefully separated to determine the percentage of foreign material which occurs naturally in hay and also to determine the varying percentages of clover and other grasses commonly found in timothy hay. This detailed work was supplemented by a thorough study of hay-trade terms and methods as found in many shipping points and receiving markets.

The results of this work have been highly encouraging and of great value in formulating definite grades for timothy hay and its mixtures with clover and other grasses. It has been found possible to express the comparative quality of hay in terms that are definite and which may be applied with approximate accuracy. Furthermore, and of chief importance, it has been found that the standards which have been developed can be taught easily to hay inspectors so that it is possible for them to grade hay by approximately uniform methods.

UNITED STATES GRADES FOR TIMOTHY AND CLOVER HAY RECOMMENDED TO THE HAY TRADE, JANUARY 2, 1923

Following these early investigations by the Department of Agriculture, a set of grades for timothy hay, clover hay, clover mixed hay, and grass mixed hay, was recommended to the hay interests of the United States on January 2, 1923. Public hearings were held at New York, Chicago, and Washington, to which all hay producers, shippers, and receivers were invited, as well as others interested in hay-marketing problems. All constructive suggestions and criticisms received at these hearings were given consideration and were employed in formulating the United States grades as finally published. Subsequent to these hearings these grades were adopted by several hay exchanges, shippers associations, and other organizations, and hay inspectors were trained in the application of the new grades.

Experience with the practical application of these grades for timothy and clover during 1923, supplemented by another year of investigations with baled hay samples, indicated that the grades as first published were somewhat complex and difficult of being fully understood and properly applied except by trained inspectors. Accordingly, in the fall of 1923 the Bureau of Agricultural Economics began work on a revised set of grades for timothy and clover hay in which the results of new investigational work could be incorporated, as well as the suggestions from the hay trade received after the first set of grades had been used. All additional facts that could be obtained from hay growers, shippers, and dealers were gathered to supplement the early work.

UNITED STATES GRADES FOR TIMOTHY AND CLOVER HAY INDORSED AND COMMENDED AT PUBLIC HEARING OF JANUARY 22, 1924

On January 22, 1924, a public hearing on timothy and clover hay grades was held at Washington, at which a representative group of delegates was present from many hay-shipping points and markets in the United States. The investigational work and observations of the Department of Agriculture were submitted to the delegates, together with a proposed set of revised and simplified grades. All major questions at issue were submitted to a vote, the results of which were given proper consideration in the final decisions. At

the close of this hearing the following resolution was introduced by a representative of the St. Louis market and unanimously adopted:

> That this conference congratulates the Bureau of Agricultural Economics, United States Department of Agriculture, on the progress made in simplifying the grading of hay to a more practical basis; that it approves of the work thus far accomplished; and further, that it is the sense of this assembly that the grades as amended are adapted to the marketing of hay and that we hereby indorse them and commend them to the trade.

United States grades for timothy and clover, as revised at the public hearing of January 22, 1924, were published, effective February 1, 1924, and are recommended by the United States Department of Agriculture. Training schools for inspectors were held during February and March, 1924, and the revised grades are now being employed at several of the principal terminal markets. Several States and associations of hay shippers have adopted these grades and are inaugurating shipping-point inspection service.

UNITED STATES GRADE SPECIFICATIONS FOR TIMOTHY AND CLOVER HAY ARE DEFINITE, SIMPLE, AND PRACTICAL

The revised United States grades provide in a simple yet definite manner the best terms for designating the numerical grades for timothy and clover hay from the evidence available to the inspector in the physical appearance and condition of the product. The percentage of mixtures, which determines the "class" of the hay, and the percentage of color and foreign material, which determine "grades" within each class, have been determined from the careful study and analysis of hundreds of baled-hay samples from many markets. The grades give proper recognition to the farm conditions of production, as well as to the established requirements and practices which represent market demand. In other words, the revised grades provide definitions and descriptions for the relative quality and condition of timothy and clover hay as commonly produced and commonly found in commerce.

The department has made a special effort, in its work on timothy and clover hay standardization, to devise grades that are simple, practical, and workable, yet definite and precise. In recommending these revised grades for timothy and clover to the hay interests of the United States, it is the belief of the Department of Agriculture that the grade definitions are so simple in language and in method of application as to be readily understood by all producers, shippers, brokers, and consumers of timothy and clover who have had practical experience with hay. Those experienced in the production or marketing of hay can apply the United States grades approximately as accurately as does the trained hay inspector.

EXPLANATION OF UNITED STATES GRADES FOR TIMOTHY AND CLOVER HAY

MEANING OF THE TERMS "CLASS" AND "GRADE"

In the United States grades for timothy, clover, clover mixed, and grass mixed hays, the term "class" is used to describe the kind or type of hay, as Timothy, Light Clover Mixed, Heavy Clover Mixed, or Light Grass Mixed. The kinds of hay, such as clover and various grasses, are computed in percentages of mixture with timothy to determine the class. For example, the class of hay entitled

Light Clover Mixed may contain from 11 to 30 per cent of clover and not over 10 per cent other grasses, the remainder of the hay to be timothy. The term "class," therefore, refers to the kind or type of hay and has no reference to quality or condition.

The term "grade," on the other hand, is used to describe the quality of hay. The quality varies in all classes of hay according to the conditions under which the hay was produced. Each class of hay is divided into three grades, namely: No. 1, No. 2, and No. 3, each such grade having different quality requirements. In all classes there is a "Sample Grade" for inferior hay not good enough for other grades.

The general term "United States grades" is used comprehensively to include all of the hay classes and the grades within each class.

CLASSES OF HAY AND CLASS REQUIREMENTS

The classification of hay into a number of definite groups or classes is necessary because production conditions are such in the timothy and clover areas of the United States that pure clover and pure grass hays are uncommon. Some pure timothy is produced, but more commonly it is mixed with varying percentages of other grasses and clover. Rotation practice demands the use of nitrogen-gathering legumes in the meadow crops, so the practice of sowing mixtures of timothy and clover is common. Thus many meadows of timothy and red clover mixed will produce Clover or Heavy Clover Mixed the first year after seeding, Timothy or Light Clover Mixed the second year, and Timothy the third year. In case alsike was sown in the meadow there would be, probably, some Medium Clover Mixed the second year and Light Clover Mixed in succeeding years. As the clover disappears such grasses as Kentucky bluegrass, Canada bluegrass, and redtop may creep into the meadows, and the hay crop would then class as Timothy, Light Grass Mixed, or Heavy Grass Mixed. Occasional meadows are found where the fine grasses were originally sown with the timothy.

The various classes of hay in the United States grades are based, therefore, on production conditions as they exist in the chief producing areas for timothy and clover and on the market demands for mixed hay as well as for pure timothy and pure clover. The classes are described in terms commonly used in hay markets.

The mixtures of various kinds of hay are all computed in percentages with timothy because timothy is the standard commercial hay in those districts of the United States wherein these grades will have the greatest use. Timothy, furthermore, is the most widespread of all hay crops on the farms east of the Missouri River.

Each class of hay is given certain minimum and maximum percentages for the kinds of hay permitted in the mixture with timothy. Thus the requirements for the class Medium Clover Mixed are that it shall contain anywhere from 31 to 50 per cent of clover and not over 10 per cent other grasses, the remainder to be timothy.

The term "clover" is not used in the United States grades in its botanical sense but rather in a popular sense to designate a group of legume forage plants commonly found in mixtures with timothy. "Clover," in the United States grades, includes medium red clover and alsike clover, also not to exceed 10 per cent (of the total hay) of alfalfa, mammoth clover, crimson clover, vetches, and other legumes

which have a recognized feeding value. The clover portion of any class of hay need not be clover of any particular kind but may be any one of a number of kinds, or a combination of kinds, provided the clover portion does not contain over 10 per cent (of the total hay) of alfalfa, mammoth clover, crimson clover, vetches, or other valuable legumes. For example, a lot of hay may contain 20 per cent red clover, 10 per cent alsike clover, and 10 per cent vetches, all of which are considered as clover. This hay is classed as Medium Clover Mixed, having a total clover content of 40 per cent. Should the estimated percentage of vetches exceed 10 per cent, however, the hay could not be classed as Medium Clover Mixed and would not come within the present definitions of the United States grades. Under these conditions the mixtures are described as accurately as possible and the hay would have to be bought or sold on "description."

The term "other grasses" is used to designate a group of cultivated grasses commonly found in timothy and clover meadows, such as redtop, Kentucky bluegrass, Canada bluegrass, meadow fescue, and quackgrass. It may include, also, such other cultivated and wild grasses and sedges as are of fine or medium texture which occur in timothy meadows and which are known to have feeding value. When these grasses are found in timothy hay in excess of 10 per cent special classes are provided for such mixtures, such as Light Grass Mixed, Heavy Grass Mixed, and Mixed Grass.

Throughout all the classes in the United States grades certain tolerances or allowances are provided for amounts of clover and grasses not to exceed 10 per cent of the whole; for example, the timothy class is allowed a maximum of 10 per cent clover and 10 per cent other grasses. Should the clover be estimated to exceed 10 per cent but not over 30 per cent the class of such hay becomes Light Clover Mixed. This class is in turn permitted to contain an allowance of not over 10 per cent other grasses in the mixture with timothy. Again if the percentage of grasses with timothy exceeds 10 per cent but is not over 30 per cent, and the clover is 10 per cent or less, the class of such hay becomes Light Grass Mixed. This same procedure with regard to tolerances is followed with all the various classes. It allows these small percentages of mixture to exist in any class which are very difficult for the hay inspector to estimate, and which do not materially affect the predominating kind or kinds of hay in the lot from which the class is determined. Whenever the mixed hay contains more than 10 per cent each of clover and grasses in a mixture with timothy, a class entitled Clover Grass Mixed is provided.

GRADES EXPRESS VARIATIONS IN HAY QUALITY CAUSED BY MATURITY AND WEATHER DAMAGE

The "grades" express the variations in hay quality found in each "class." Quality in hay varies with the maturity or time of cutting, whether cut early or late, with the methods of curing and storage, and with the character and extent of the weather damage. Thus the description of a grade is, in effect, a brief, summarized statement about the maturity of the hay plants at time of cutting and the damage, if any, suffered by the crop during the harvesting, stacking, baling, and shipping periods.

The age or maturity of the plants at time of cutting has a direct bearing on the grade or quality of the hay. As plants approach maturity and the processes of seed formation, an appreciable percentage of the starch, sugar, and protein in the sap of the leaves and stems is carried gradually to the seed head and to the roots where these nutrients are not available for feeding. At this period the leaves and stems have fulfilled their function of manufacturing various food nutrients and the tissues become woody and hard. It is common knowledge among botanists and chemists that the percentage of protein and carbohydrates diminishes in the leaves and stems of timothy and clover plants when the seed-maturing stage of growth has arrived, and that the percentage of crude fiber increases. Thus hay that became ripe, or nearly ripe, before it was cut, is woody, unpalatable, and lower in feed value than hay that was cut just prior to the period of seed formation. When the leaves and stems have ceased to function they immediately begin to fade and turn brown. Thus, approximately, the presence or absence of natural green color in hay is a guide to quality or grade.

Weather damage has a direct bearing on the grade or quality. Hay cut at the proper stage of maturity may deteriorate to a low grade if exposed to severe rains and sun bleaching. Weather damage affects the appearance of hay and raises doubts in the buyer's mind as to its soundness, especially so if it has been severely stained, bleached, or browned. Exposure to rain causes loss of sweet odor, palatability, and certain important nutrients such as protein. Weather damage may be slight, moderately severe, or very severe, and the extent of the damage, therefore, will cause various degrees of quality or grade. With weather damage, as with maturity, the presence of natural green color in hay indicates good curing with resultant sweet odor, palatability, and maximum feed value.

Timothy hay divides naturally into three general quality groups according to the conditions and methods under which it was produced. Every bale or lot presents some evidence regarding the methods of curing and the maturity of the hay which is indicative of quality. A brief sketch of the three quality groups for timothy hay is given herewith:

Group I (Grade 1, including the Super Grade "Choice").—Hay cut not later than full bloom and cured with very little, if any, damage from rain or sun bleaching. Slight damage from dews, fogs, light showers, or sun bleaching not sufficient usually to reduce the natural green color below 50 per cent of the total area of the leaves, stems, and heads.

Group II (Grade 2).—Hay cut not later than full bloom which received more than slight damage but not severe damage from light showers, numerous heavy dews, or excessive sun bleaching. Also hay cut after full bloom with seeds formed or seeds partly ripe, which was cured with little, if any, damage from the elements. In either case the damage sufficient to reduce the natural green color below 50 per cent of the total area of the leaves, stems, and heads.

Group III (Grade 3).—Hay cut not later than full bloom or at time of seed forming, which received severe damage in the swath, windrow, or cock from heavy rain or from numerous showers followed by excessive sun bleaching. Also hay cut so late that seeds are ripe, leaves brown, and stems woody from maturity and natural curing prior to cutting. In either case the injury sufficient to reduce the natural green color below 30 per cent of the total area of the leaves, stems, and heads.

The formulating of grades for hay is largely a problem of employing simple yet definite methods and definitions for expressing the

quality and condition in those groups above described which represent the general quality characters of hay. The specifications employed in the United States grades for timothy and clover hay express in a concise manner the variations in quality arising from maturity, improper curing, and weather damage.

GRADING FACTORS EMPLOYED IN UNITED STATES GRADES FOR TIMOTHY AND CLOVER HAY

It is possible to express the quality of hay with various terms and by various methods. Good, fair, and poor quality, or high, medium, and low grade, will describe the quality of hay in general terms. The fault in grading hay by the use of these general terms is that the terms are indefinite and susceptible of diverse interpretation and application. It would be difficult to find three or more experienced hay growers or hay dealers who could agree on the definition of "good quality" or "high grade." More definite terms are necessary to define sharply the lines between grades or relative quality. In the United States grades for timothy and clover hay two grading factors are employed, namely, color, and the percentage of foreign material.

NATURAL GREEN COLOR THE MOST IMPORTANT GRADING FACTOR

Color, meaning the natural green color, is an important grading factor, in the first place, because it "sells hay." The presence of natural green color in hay is the buyer's insurance against unsoundness and his evidence of palatability and maximum feeding value. In the second place, the percentage of natural green color is an approximation of the percentage of the hay undamaged by rain, by age prior to cutting, or by bleaching during the curing process, and, therefore, to a certain extent a measure of the quality and feeding value.

COLOR REQUIREMENTS FOR TIMOTHY AND OTHER GRASSES

The natural green color requirements for timothy in the United States grades are as follows: Choice grade, 70 per cent or more green; No. 1 grade, 50 per cent or more green; No. 2 grade, 30 per cent or more green; and No. 3 grade, less than 30 per cent green. The percentage green requirements mean that in case of No. 1 timothy, for example, at least 50 per cent of the total area of the leaves, stems, and heads of the hay plants must be natural green in color. Conversely stated there may be 50 per cent of the total plant area that is brown, bleached yellow, or otherwise off color. Investigational work accomplished by the Department of Agriculture has shown that of the total area of the timothy plant the leaf area comprises approximately 50 per cent, stem area 40 per cent, and head area 10 per cent. In analyzing or estimating the percentage of green color in timothy hay these area rules are employed to merge the color on all portions of the plants into a percentage expression (such as 50 per cent green for No. 1 Timothy) for the mass color of the hay. These methods for defining the amount of natural green color in timothy hay have made it possible to draw sharp and definite dividing lines between Choice, No. 1, No. 2, and No. 3 Timothy by a measure of value that is outstanding to the eye and that has a direct relationship to palatability and feeding value.

The color requirements for the various grades of "other grasses" such as Kentucky bluegrass, Canada bluegrass, and redtop are identical with those for timothy. A lot of hay, for example, consisting of 60 per cent timothy and 40 per cent Kentucky bluegrass, and thus classed as Heavy Grass Mixed, must have 50 per cent or more green color in the entire mass of hay in order to grade No. 1.

COLOR REQUIREMENTS FOR CLOVER HAY

The color requirements for the three grades of clover hay in the United States grades are not expressed in percentage terms as in case of timothy and other grasses. The natural colors of clover hay vary so greatly between medium red clover, alsike clover, and mammoth clover, or as between clovers produced in different regions, that it has been found impracticable to formulate rules for defining color requirements in percentage terms.

The color requirements for the three grades of clover have been expressed, therefore, as follows: No. 1 grade, green to greenish brown; No. 2 grade, greenish brown to brown; and No. 3 grade, dark brown. These terms are interpreted and applied as follows:

No. 1 grade: Green to greenish brown is the natural color of various types of clover hay cut not later than full bloom, cured under favorable conditions, and free from weather damage. Brown colors in the heads and some of the leaves are natural to the clovers and are not evidence of damage. A distinct amount of natural green color must be present in the stems and leaves, however, for the sample to grade No. 1.

No. 2 grade: Greenish brown to brown color in clover hay is the blended or intermediate color between natural green and dark brown. Clover stems and leaves to come under this definition must have light tinges of green. They must not be completely brown nor completely faded in appearance. This color in clover is commonly found when the hay has been slightly damaged by heavy dews or light showers followed by sun bleaching or when the clover has matured too long in the field prior to cutting.

No. 3 grade: Dark brown in clover is that color wherein no tinge of green is visible but where all the stems and leaves are dark brown and completely faded. This color in clover hay results from severe damage from heavy rains or from numerous light rains and sun bleaching through a period of several days while the hay is in process of curing. This grade of hay may be caused also by the clover becoming excessively overripe prior to cutting.

It is not intended in making application of these clover color requirements to the grading of clover hay that No. 1 grade shall require 100 per cent green color nor that typical No. 1 grade shall be the bright, vivid green color found in perfectly cured, northern-grown alsike clover. The requirements for No. 1 grade clover permit the brown heads and leaves so often found in well-cured medium red clover. The definition must be interpreted, however, to mean that natural green color shall be present in the clover stems as evidence of the fact that the clover was cut in proper season and cured with very little, if any, weather damage.

The definition for No. 2 grade clover, greenish brown to brown, describes a very characteristic color of clover which has received enough rain damage during the curing process to destroy true natural green color but to leave an intermediate color between green and dark brown which is light brown having very light tinges of green. The dark-brown color requirement for No. 3 grade clover needs little, if any, explanation. This color is typical in clover which has been severely damaged by rain.

Occasionally these color specifications for clover will overlap in a lot of hay: that is, the entire lot as a whole will not come under one or the other of the definitions. In such instances the color specifications that describe the major portion of the lot should establish the grade.

COLOR REQUIREMENTS FOR MIXED TIMOTHY AND CLOVER HAY

In lots of mixed timothy and clover hay the grade is established by a combination of the color requirements for timothy and clover. A lot of hay, for example, which is 50 per cent timothy and 50 per cent clover (Medium Clover Mixed) has 55 per cent green color in the timothy and green to greenish brown color in the clover. Thus the grade is No. 1. Should a lot of hay of similar mixture have timothy with 55 per cent green color and clover that is greenish brown to brown in color, the grade would be No. 2, as the lower grade of the clover would govern the entire lot. In the event of a lot of mixed hay containing 80 per cent timothy and 20 per cent clover, where the timothy was over 50 per cent green, and therefore No. 1 grade, while the clover was greenish brown to brown, and therefore No. 2 grade, the grade of the entire lot is No. 1 because of the much greater amount of the timothy in the entire lot of hay. Similar instances will occur where the clover predominates. Conflicts of color specifications in mixtures of timothy and clover are not common, because clover ripens earlier than timothy and thus if the hay is cut when the clover is in full bloom the timothy will be cut early and will carry a high precentage of green color. Sometimes, however, late cutting of the clover, or weather damage, will cause a conflict of colors in mixed timothy and clover hay.

FOREIGN MATERIAL A SECONDARY GRADING FACTOR

Foreign material in hay refers to weeds and such sedges, rushes, and other plants as are coarse and not suitable for feeding purposes; and to cornstalks, stubble, chaff, and other objectionable matter which occurs naturally in hay.

Hay separation analyses made by the Department of Agriculture on many representative bales from numerous markets placed 8 per cent in Sample Grade on account of foreign material. These bales of sample hay contained an average of 30.6 per cent foreign material, mostly dock, daisies, and other weeds cut with the clover. The remaining bales, of which 30 per cent were timothy and 70 per cent various classes of mixed hay, contained an average of 5.6 per cent foreign material. The timothy and clover mixed bales contained an average of 7 per cent foreign material. The grass mixed bales contained an average of 5 per cent foreign material.

Foreign material is pure waste, or dockage in hay. It is usually rejected by livestock and remains uneaten in the feed mangers. When hay is purchased by a feeder of livestock the buyer does not get full value for his money if the hay contains much foreign material. Foreign material is detrimental in hay and if present in any considerable quantity it is just and proper that the grade, and thus indirectly the price, should be lowered according to the percentage of weeds or other foreign material.

In the United States grades a maximum of 10 per cent foreign material is allowed in No. 1 grade before the grade may be lowered

on account of foreign material. This applies to all classes of timothy and its mixtures except in the super grade Choice Timothy where the amount of foreign material can not exceed 5 per cent. In all classes No. 2 grades permit a maximum of 15 per cent foreign material and No. 3 grades permit 20 per cent.

The allowance of foreign material in each grade is based upon these laboratory studies with respect to foreign material made by the Department of Agriculture of numerous representative bales of hay selected from many markets and upon field observations made in the producing areas for timothy and clover hay. It is recognized that a small amount of weeds and other foreign material occurs naturally in the production of hay and that the meadow of absolutely pure hay is uncommon. This situation exists always in meadows where clover is sown with the timothy and where the meadows are being plowed and reseeded intermittently in crop rotation plans. Under such farm conditions a small percentage of weeds and stubble in hay is inevitable, therefore due allowance has been provided in the United States grades for foreign material. When meadows are so foul with weeds or trash as to place relatively large percentages of foreign material in market hay it is penalized by being lowered in grade.

When the percentage of foreign material exceeds the amount prescribed for any particular grade, that is to say, 10 per cent for No. 1 grade, 15 per cent for No. 2 grade, and 20 per cent for No. 3 grade, the hay which is otherwise of good quality is lowered in grade on account of the foreign material. For example, a lot of hay is estimated to consist of 70 per cent clover, 12 per cent timothy, and 18 per cent foreign material, thus being classed as Clover. The clover color is green to greenish brown with no evidence of weather damage, thus the grade would be No. 1 so far as color is concerned. The presence of 18 per cent foreign material, however, takes the hay out of both the No. 1 and No. 2 grades and places it in No. 3 grade. In all cases where the amount of foreign material is over 20 per cent the hay must be graded Sample Grade, even though the hay is sound and has sufficient color for the No. 1 grade.

INJURIOUS FOREIGN MATERIAL

Some foreign material which is very injurious to livestock occurs in hay. This injurious foreign material is defined in the United States grades as sandburs, poisonous plants, wild barley or squirrel-tail grass (known as fox-tail in some regions), and other similar matter which is injurious when fed to livestock. Wild barley or squirrel-tail grass is probably the most widespread weed of injurious character. It often causes severe irritation of the gums, tongues, and mouths of livestock, causing loss of weight and growth in many instances, and occasionally causing death.

The presence of an appreciable amount of injurious foreign material places the hay at once in Sample Grade irrespective of color or other desirable qualities.

THE USE OF SAMPLE GRADE

All hay to enter No. 1, No. 2, or No. 3 grades must be sound and free from mold or other unsoundness. In the United States grades a place is provided in Sample Grade for all hay that is unsound, that

contains more than 20 per cent foreign material, or that is of otherwise distinctly low quality. The term "No Grade" is not used in the United States grades as has been customary in the grades of the National Hay Association or other organizations. Sample Grade is intended as a dumping place for all threshed and headed hay, excessively overripe hay, or hay that is moldy, hot, wet, or caked. It is intended that no grade evidencing relative quality shall be placed upon any such hay but rather that the term Sample Grade shall convey the idea of distinctly low quality hay which should be bought or sold by sample rather than by a statement of definite grade evidencing quality.

HAYMAKING, BALING, AND LOADING METHODS ESSENTIAL TO THE MARKETING OF HIGH-GRADE HAY

On many farms the hay crop receives less thought and attention than such field crops as corn, wheat, oats, or potatoes. The other crops are attended to first, and hay receives attention only during the slack periods of work. When farm labor is scarce, when corn or wheat is the chief farm enterprise, and when hay is a crop of secondary importance in the farm income, it is only natural that hay should be the crop to suffer most from inattention. But if hay is to be relied upon as a chief source of farm income, or if hay is to be produced for market and so considered as a cash crop, it must be managed with the same degree of forethought and attention as the good farm manager gives to a valuable crop of corn, wheat, or potatoes.

No producer who plans to ship hay to the markets should expect to have high grades and to receive top prices unless he plans to have clean meadows, to cut the hay in proper season, to cure and store the crop as quickly as possible, and to bale and load the hay according to the demands of the markets. Many of the ultimate buyers of hay are dairymen, livestock feeders, cotton planters, and other farmers, who represent the real buying demand in the markets and they want palatable, nutritious hay that gives real value for the prices they pay. Hay that is unsound, overripe, full of weeds, badly stained, or otherwise of low quality is a drug on the market. Low-grade hay should not be baled and shipped to market but should be consumed on the farm. The greatest part of the troubles and dissensions in hay marketing arises over low-grade hay. In these times of high freight rates it does not pay, ordinarily, to ship a low-grade product.

Space will not permit a full discussion of the subjects of haymaking and hay marketing, but an outline is given of certain important features which have a direct relationship with hay grades.

A GOOD "STAND" IS NECESSARY TO PRODUCE HIGH-GRADE HAY

Good crops of high-grade hay can not be produced from thinly sown meadows nor from very old meadows where the stand has become thin. Invariably such meadows are weedy and grassy, and it is thus impossible to produce pure hay having an attractive appearance on the market. The foundation in the business of hay marketing is a good stand of pure hay. Seed of good varieties, free from foul weeds, and sown in sufficient quantity to produce a thick stand of hay is of the greatest importance.

Hay authorities in the timothy and clover areas of the United States usually recommend rates of seeding per acre as follows: Timothy alone, 10 to 14 pounds; red clover alone, 8 to 10 pounds; timothy and red clover mixed, timothy 8 to 10 pounds, red clover 4 pounds; timothy and alsike clover mixed, timothy 10 pounds, alsike clover 2 to 3 pounds; and timothy, red clover, and alsike clover mixed at the rate of timothy 8 pounds, red clover 3 pounds, and alsike clover 2 pounds. Wherever soil conditions permit, that kind of pure hay or mixed hay should be grown which is known to be in the greatest demand at the markets available to the producer and shipper.

Good policy in the production of hay for market, as well as good crop-rotation practice, requires the occasional breaking up of old meadows. The yield per acre is low on old meadows and the percentage of weeds and fine grasses usually high. Weeds lower the grade of hay and there are prejudices against grass-mixed hay in many markets, notably in the South.

RAKING MEADOWS IN SPRING OF YEAR

Hay inspectors and buyers in all markets are likely to discriminate against dirty hay. Under the United States grades inspectors are authorized to grade hay downward if it contains amounts of stubble, corn stubs, old, rotten hay of the previous year's cutting, or weeds, in excess of 5 per cent for Choice Timothy, 10 per cent for all No. 1 grades, 15 per cent for all No. 2 grades, and 20 per cent for all No. 3 grades. For this reason it will pay the producer who plans to ship baled hay to market to rake the meadows in the spring of the year in order to remove stubble and corn stubs from newly seeded fields, or to remove the spoiled hay left over from the previous year's operations. Pureness and attractive appearance are important factors in making a profitable sale of hay irrespective of whether the amount of foreign material causes a lowered grade or not. Meadows can be raked in the spring at the rate of 15 to 20 acres per day for 1 man and 2 horses. The loss of one grade in the market on account of foreign material for a field of 15 acres yielding 1 ton per acre would amount to $15 to $30, and possibly more.

TIME OF CUTTING FOR TIMOTHY HAY

Timothy hay should be cut not later than full bloom to meet the requirements of the United States No. 1 grade. (See fig. 2.) The total digestible food nutrients per acre of timothy cut at full bloom is greater than for timothy cut before bloom or with seed in the dough. Experimental work at the Missouri Agricultural Experiment Station [1] on this subject gave average results as follows: Timothy cut when coming into bloom had an average of 1,996 pounds of total digestible dry matter per acre, of which 135 pounds were protein; cut in full bloom, 2,175 pounds of total digestible dry matter, of which 147 pounds were protein; cut with seed in the dough, 1,914 pounds of digestible dry matter, of which 98 pounds were protein; and cut with seed ripe, 1,775 pounds of digestible dry matter, of which 92 pounds were protein.

Timothy cut at full bloom not only has more feed value per acre than timothy cut with the seed in dough or seed ripe, but it also has

[1] Missouri Agricultural Experiment Station, Research Bulletin No. 19. 1915.

a higher percentage of green color and therefore sells to greater advantage. When timothy is allowed to stand in the field after full bloom the leaves and stems gradually turn brown and the feed value diminishes. Thus, even with perfect curing, it is impossible to get as high feed value and as attractive sale appearance in late cut timothy as in timothy cut at full bloom.

TIME OF CUTTING FOR CLOVER HAY

The rule for time of cutting clover hay, most commonly advocated in the clover regions of the United States, is when the clover has

FIG. 2.—Timothy should be cut not later than full bloom to meet the requirements of U. S. No. 1 grade. Late cutting of timothy produces a woody, brown, low-grade hay. Clover should be cut in full bloom or not later than when one-half the clover heads have begun to turn brown. Late cutting of clover produces stemmy hay and brown colors. Mixtures of timothy and clover should be cut when the clover is in full bloom rather than when the timothy is in full bloom, because clover matures earlier.

reached full bloom. (See fig. 3.) Some authorities state that the proper period for cutting may extend from full bloom to not later than when half of the clover heads have begun to turn brown. When clover is allowed to stand in the field too long after full bloom many leaves turn brown or fall off and the stems gradually become woody. In such cases the hay is likely to appear "stemmy" and dull colored in the bale and thus lose its attractive appearance for sale if it does not actually lose a grade.

TIME OF CUTTING FOR TIMOTHY AND CLOVER MIXED HAY

Mixtures of timothy and clover to meet the requirements of United States No. 1 grades for clover mixed hay should be cut at the time the clover is at the proper stage for harvesting, namely, when the

clover is in full bloom. As a general rule, red clover matures to the blooming stage 10 days to 2 weeks earlier than timothy. Thus if cutting should be delayed until the timothy is in full bloom, the clover would be overripe and of lower quality and grade than if it had been cut at the proper time. The effect of cutting timothy 10 days or 2 weeks ahead of full bloom is to decrease its yield slightly but to raise its percentage of green color and its attractiveness in the clover mixture. The slight loss in timothy yield is immaterial when the clover predominates in the mixture.

Mixtures of timothy and alsike clover should be cut when the alsike is in full bloom. Alsike has a tendency to come into bloom a little later than red clover, especially on moist soils, and it will hold its leaves and green color longer after bloom than does red clover. For these reasons the cutting time for timothy and alsike may be more nearly identical than for timothy and red clover.

CURING METHODS TO PRESERVE LEAFINESS AND COLOR

Haymaking methods must of necessity vary with the kind of hay, the local climatic conditions, the farm conditions and buildings, and the available equipment of labor and machinery. The proper curing of hay rests to a great extent with the judgment, energy, and experience of the farm manager. For these reasons no attempt will be made to discuss the subject of haymaking in detail, but rather to point out a few of the most common errors made in curing and storing which are reflected in the low grades of hay found in the markets.

Hay which has been cut at the proper time will grade high unless it is bleached by lengthy exposure to sunlight in the swath and windrow, damaged by rain in the swath and windrow, or stained and weathered severely in the stack. These are the principal causes for loss of quality after cutting. Loss of quality from excessive swath bleaching or from poorly built stacks is entirely within the power of the farm manager to control. Losses from rain damage in the swath and windrow can not always be controlled and at the best can be only minimized.

In many districts there is a tendency to allow hay to dry too long in the swath, which practice causes an excessive amount of bleach with an accompanying loss of bright, natural green color. Swath bleaching, especially in regions having heavy dews, causes prominent streaks of yellow and white colors to appear that reduce the percentage of natural green color and detract from the general appearance of the hay when it is baled and offered for sale. Wherever the dump rake is used in haymaking, and where it is not planned to cock the hay, it is common practice to dry the hay thoroughly in the swath and to then rake it into windrows shortly before hauling. On bright, hot days this method of curing hay conduces swath bleaching and burns the leaves of clover. Then when the dry hay is raked, the clover leaves shatter and are partially lost. Often the result is the product called "stemmy" hay in the trade.

These conditions in haymaking, which may lower the grade of hay, can be remedied to a considerable extent by the intelligent use of the side-delivery rake, especially when heavy mixtures of clover are being handled in quantity. The effectiveness of this rake, and the principles underlying its use, demand that the raking shall be done when the hay in the swath is somewhat sappy and not when it is

well dried. When hay is rolled into somewhat cylindrical windrows with the side-delivery rake, many leaves within the loose roll are protected from burning and will cling to the stalks. Furthermore, a large proportion of the leaves and stems will cure without the bleaching which comes from direct exposure to sunlight. On the other hand, if hay is allowed to dry too long in the swath there is a loss of green color from sun bleaching and a loss of leaves when the hay is finally rolled from the swath into windrows by the side-delivery rake. The proper time to put the side-delivery rake in the field is when the hay has lost its newly cut freshness and wetness but when it is yet tough and somewhat sappy. Farmers in the timothy and clover areas of the United States who handle relatively large areas of hay and who store it in barns or sheds have conditions that justify and necessitate the use of the side-delivery rake and the hay loader in curing hay and moving it swiftly from the windrow to the barn.

STORAGE METHODS TO PRESERVE QUALITY

Delays in hauling are also responsible for loss of grade. Once the hay is in the windrow every effort should be made to haul and store it at that stage of curing when it is no longer wet and before it becomes dry and brittle. Slightly tough hay with clinging foliage, which goes through a moderate sweat in the mow or stack, is the type of hay which bales to the best advantage and which has the brightest color and the greatest degree of palatability.

Timothy and clover are too often stacked in low, flat, hand-pitched stacks of 2 to 4 tons in a stack. Such stacks weather badly and often become severely stained and partly rotten. When hay is baled from such stacks and shipped to market one car usually contains several grades and may contain a few bales of Sample Grade hay. These practices are decidedly unprofitable for the producer who wishes to make hay a cash crop and to market it to advantage. Timothy and clover hay can be stacked direct from the windrows with the sweep rake and stacker, and hay of good quality can be baled out of the stacks if proper care is given to the stacking. Stacks holding 10 to 15 tons can be built easily with either of several types of hay stackers. These stacks, if symmetrically built and well tramped in the center, will shed water and the hay will weather severely only on the outside of the stack. The percentage of weather-damaged hay on the outside of the stack to total stack tonnage is much less in large stacks than in small stacks. The risk of damage to the center of the stack is small if the stack was drawn out with side-wall bulges 3 to 4 feet above ground level, tramped tight in the center and drawn to a peak at the top. In regions of heavy rainfall, a small load of wild hay or wheat or rye straw may be used to finish out the peak of the stack and to spread over the top to assist in shedding the rain.

MINIMIZING RAIN DAMAGE TO HAY

Rain damage while hay is in the swath, windrow, bunch, or cock is the hay producer's greatest bugbear. Sometimes summer showers or unexpected heavy rains come and foil the plans of the best managers. Through a period of years, however, careful plan-

ning as to the best time of day, in any locality, to cut hay and rake it, together with the use of modern machinery such as the hay loader or sweep rake and stacker, to rush the hay quickly from the windrow to the barn or stack, will eliminate many of the severe losses which arise from rain damage. Several rather commonplace facts always should be kept in mind: If hay has been cut and a rain is imminent the hay will receive less damage in the swath than in the windrow; less damage in the windrow than in the big bunch made by the dump rake from the windrow; and if an attempt is to be made to cock hay overnight or over Sunday the cocks must be built up large and high with hand pitching, because a flat, low-built cock made with the dump rake or fork provides conditions which facilitate rain damage.

In these times of relatively high wages and inefficient farm labor the practice of cocking hay to sweat it in the field, or to insure it against rain damage, is not common. The haymaker's plans for minimizing losses from rain damage must place greater reliance upon the side-delivery rake, the hay loader, the sweep rake and stacker, and upon the organization of his crew to provide rapid haulage and storage than upon the more expensive and tedious practice of cocking. Unexpected showers that will convert the grade of hay from No. 1 to No. 2 often can not be avoided, but damage that produces a No. 3 grade of hay is traceable to bad management as often, if not more often, than to ill fortune.

BALING PRACTICE

Whenever the individual producer, a neighborhood group of producers, or others interested in the baling of hay are considering the purchase of a hay press it is wise to select that type of press that will put out bales of the size and weight best adapted to the demands of the terminal markets in which the hay is to be sold. Various hay markets in the United States favor one type and size of bale and are prejudiced against other types. For example, New York City prefers and pays a premium for the upright, box-pressed bale weighing 190 to 220 pounds. Boston also prefers the big, box-pressed bales. Philadelphia and Cleveland have a preference for the medium size, 17 by 22 inches, perpetual-press bale, tied with three wires, and weighing 125 to 150 pounds. Chicago, St. Louis, and other markets are accustomed to handle the perpetual-press bales, either 17 by 22 inches or 14 by 18 inches, but prefer the smaller bale weighing about 100 pounds. The shipper and producer will always benefit by catering to the preference of his market. He can not afford to ignore the established market demands.

Neatness and tight tying of the bales is another important feature of hay marketing. Ragged looking bales, loosely or unevenly tied, are sometimes discriminated against in price, because the appearance of the car lot is unattractive and because of the risk of breaking bales while handling them. It pays to give thought and care to the feeding of the press, to its tension, and to the tying. Press feeders should be instructed to throw out the occasional bunches of coarse weeds, sweet clover, and spoiled hay that are often found mixed with good hay. The car-door appearance of a lot of good hay can be injured by the presence of bales having slugs of weeds, rubbish, or spoiled hay.

When hay is baled from the stack the utmost care should be taken to remove the weathered top and sides of the stack prior to baling. Moldy or stack-burned slugs of hay, occasionally found in the center of the stack, and the bottom layer of hay that has been next to the ground should not be fed into the press. A relatively small percentage of such stack-injured hay will spoil the general appearance of a baled lot of really good stack hay. All such stack-spoiled hay has some value on the farm, but may cause a loss of grade and price in the markets.

Snow and light rains are the cause of many losses in baling hay from the stack or in hauling barn-baled hay. It takes but a relatively small amount of snow or rain on baled hay to raise the moisture content to a point where it will heat in the cars during transit or subsequently in the warehouse. Hot or heating hay may be seen every year in the markets in the early autumn or early spring, which was cured and stored properly but received enough moisture subsequently from snow or rain during the baling, hauling, or loading periods to cause heating and various degrees of fermentation. The result of these conditions is usually unsound hay that is either rejected or sold as Sample Grade at low prices. Every shipper of hay should therefore exercise care to bale and load during days of bright weather and to protect piles of baled hay in the field from snow squalls or showers.

Baling hay in the field from the windrow or cock is a practice that causes much trouble and dissension in hay marketing unless the curing and drying conditions are very favorable at the time of baling. Every year when the early field-baled shipments of hay move to market many cars of hot, sour, or moldy hay are discovered. It is difficult to bale hay in the field and produce sound hay of good quality that will stand shipment and storage in warehouses, because the hay is likely to be baled when partially cured and prior to having gone through the sweat. Under such conditions of baling the sweating takes place in the bales during transit or in the warehouse, and the tightly packed bales are likely to heat, to ferment and turn sour, or possibly to mold. If the hay is overdried in the swath to prevent bale heating there is a loss of color and leafiness that is detrimental to quality.

As a general rule the stacking or mow storage of hay to sweat it prior to baling is a safer and more profitable policy to follow than to bale from the windrow. Occasionally it is justifiable and profitable to practice field baling when a shortage of hay exists in the markets during the summer months and prices are abnormally high. Under these conditions field baling to rush hay into an early market will make extra profits providing a hay press and efficient labor are immediately available and providing careful management is provided to cure the hay fully prior to baling. The occasional savings of labor or the early market profits that may be possible in the practice of field baling under favorable circumstances are more than offset usually, during a term of years, by the losses in quality that arise from failure to store hay promptly when it is cured in the field or by the losses that arise from the shipment of partially cured hay that spoils in transit.

LOADING HAY IN CARS

Piles of baled hay in the barn or in the field provide an excellent opportunity to grade and sort the hay prior to loading for shipment to market. At this time in the preparation of hay for market, all widely different classes and grades should be sorted and separated prior to loading. If any bales of distinctly low quality were pressed from bunches of weeds or from spoiled hay they should be culled out and reserved from shipment. If different classes of hay were baled from different meadows, such as Timothy, Medium Clover Mixed, or Light Grass Mixed, the various classes should be separated so far as possible because it is not good policy to load a number of classes of hay in the same car if it can be avoided. Similarly, if a portion of the hay is No. 1 grade, cured without rain damage, and another portion is No. 2 grade because of excessive sun bleach or moderate rain damage, it is best to separate the two grades prior to loading.

If different grades are loaded in the same car it is very difficult for the terminal market inspector to place a proper grade on the entire carlot. When two distinct grades are present he cannot average the grades and designate one grade for the carlot. The best he can do is to count the bales of each grade and certify that he inspected so many bales each of No. 1 and No. 2. In case of car-door inspection, the presence of bales of different grades raises doubt in the buyer's mind as to what percentage of the entire carlot is No. 1 and what percentage is No. 2 and the result of this situation may be that the hay will not sell to the best advantage. The better policy is to load hay of uniform grade.

In the loading of hay in carlots it sometimes happens that the shipper does not have enough hay of uniform grade to fill one car or to fill out the last car in the shipment. Under these circumstances the best policy to follow is to load uniform hay of one class or grade in one end of the car and the different class or grade in the other end. The total number of bales loaded in each car, together with the number of bales of each class or grade, should then be stated plainly on the shipper's invoice. This policy of describing the hay shipment fully and frankly on the invoice is appreciated by consignees and inspectors and is a benefit to the shipper in marketing hay advantageously. Ultimately such a policy, consistently followed, builds up a reputation for the shipper that creates a demand for his product and adds to his profits. Conversely the policy of loading No. 1 hay in the car doorway and No. 2 or No. 3 hay in the ends of the cars, or the policy of slipping in 10 or 15 bales of spoiled hay in every car on the general theory that they will be overlooked, will usually bring trouble and loss of profit in the long run. Wherever plug inspection exists (which means opening up an alleyway through the bales in the car prior to inspection) the variance in grade is sure to be discovered to the ultimate, if not immediate, detriment of the shipper. Even where car-door inspection is made the discovery of plugged carlots of hay is sure to be made when the hay is unloaded and the buyer will call for a reinspection of the entire lot.

Hay is so bulky and the car load so low in value in proportion to the carlot freight rate that under normal market conditions it pays best to bale and load only good, sound hay of uniform grade. The steady and normal market demand is for the No. 1 and No. 2 grades,

and No. 3 grade sells to advantage only when abnormal shortages exist with a consequent strong demand for any hay that is feedable.

DESCRIPTIONS OF EACH CLASS AND GRADE IN UNITED STATES GRADES FOR TIMOTHY, CLOVER, CLOVER MIXED, AND GRASS MIXED HAYS

All Timothy, Clover, Clover Mixed, and Grass Mixed hays which do not fall into Sample Grade are divided into nine classes. Each class is divided into three numerical grades with an additional supergrade known as United States Choice in the Timothy Class.

SAMPLE GRADE

United States Sample Grade.—Shall include all timothy, clover, clover mixed, and grass mixed hay which has been threshed, headed, or contains more than 20 per cent foreign material, or contains any injurious foreign material, or has any objectionable odor, or is heating, hot, wet, moldy, musty, caked, or is otherwise of distinctly low quality.

TIMOTHY CLASS

United States Choice Timothy.—Shall be timothy hay which contains not more than 5 per cent clover, 5 per cent other grasses, and 5 per cent foreign material. The timothy shall have 70 per cent or more green color.

United States No. 1 Timothy.—Shall be timothy hay which contains not more than 10 per cent clover, 10 per cent other grasses, and 10 per cent foreign material. The timothy shall have 50 per cent or more green color.

United States No. 2 Timothy.—Shall be timothy hay which contains not more than 10 per cent clover, 10 per cent other grasses, and 15 per cent foreign material. The timothy shall have 30 per cent or more green color.

United States No. 3 Timothy.—Shall be timothy hay which contains not more than 10 per cent clover, 10 per cent other grasses, and 20 per cent foreign material. The timothy shall have less than 30 per cent green color, unless the hay contains more than 15 per cent foreign material.

LIGHT CLOVER MIXED CLASS

United States No. 1 Light Clover Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent clover, 10 per cent other grasses, and 10 per cent foreign material. The timothy shall have 50 per cent or more green color and the clover a green to greenish brown color.

United States No. 2 Light Clover Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent clover, 10 per cent other grasses, and 15 per cent foreign material. The timothy shall have 30 per cent or more green color and the clover a greenish brown to brown color.

United States No. 3 Light Clover Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent clover, 10 per cent other grasses, and 20 per cent foreign material. The timothy shall have less than 30 per cent green color and the clover a dark brown color, unless the hay contains more than 15 per cent foreign material.

MEDIUM CLOVER MIXED CLASS

United States No. 1 Medium Clover Mixed.—Shall be a mixture of timothy hay with not more than 50 per cent clover, 10 per cent other grasses, and 10 per cent foreign material. The timothy shall have 50 per cent or more green color and the clover a green to greenish brown color.

United States No. 2 Medium Clover Mixed.—Shall be a mixture of timothy hay with not more than 50 per cent clover, 10 per cent other grasses, and 15 per cent foreign material. The timothy shall have 30 per cent or more green color and the clover a greenish brown to brown color.

United States No. 3 Medium Clover Mixed.—Shall be a mixture of timothy hay with not more than 50 per cent clover, 10 per cent other grasses, and 20 per cent foreign material. The timothy shall have less than 30 per cent green color and the clover a dark brown color, unless the hay contains more than 15 per cent foreign material.

HEAVY CLOVER MIXED CLASS

United States No. 1 Heavy Clover Mixed.—Shall be hay which contains not more than 80 per cent clover, including not more than 10 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder to be timothy. The clover shall have a green to greenish brown color and the timothy 50 per cent or more green color.

United States No. 2 Heavy Clover Mixed.—Shall be hay which contains not more than 80 per cent clover, including not more than 15 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder to be timothy. The clover shall have a greenish brown to brown color and the timothy 30 per cent or more green color.

United States No. 3 Heavy Clover Mixed.—Shall be hay which contains not more than 80 per cent clover, including not more than 20 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder to be timothy. The clover shall have a dark brown color and the timothy less than 30 per cent green color, unless the hay contains more than 15 per cent foreign material.

CLOVER CLASS

United States No. 1 Clover.—Shall be hay which contains more than 80 per cent clover, including not more than 10 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder, if any, to be timothy. The clover shall have a green to greenish brown color.

United States No. 2 Clover.—Shall be hay which contains more than 80 per cent clover, including not more than 15 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder, if any, to be timothy. The clover shall have a greenish brown to brown color.

United States No. 3 Clover.—Shall be hay which contains more than 80 per cent clover, including not more than 20 per cent foreign material, and which contains not more than 10 per cent other grasses, the remainder, if any, to be timothy. The clover shall have a dark brown color, unless the hay contains more than 15 per cent foreign material.

LIGHT GRASS MIXED CLASS

United States No. 1 Light Grass Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent other grasses, 10 per cent clover, and 10 per cent foreign material. The timothy and other grasses shall have 50 per cent or more green color.

United States No. 2 Light Grass Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent other grasses, 10 per cent clover, and 15 per cent foreign material. The timothy and other grasses shall have 30 per cent or more green color.

United States No. 3 Light Grass Mixed.—Shall be a mixture of timothy hay with not more than 30 per cent other grasses, 10 per cent clover, and 20 per cent foreign material. The timothy and other grasses shall have less than 30 per cent green color, unless the hay contains more than 15 per cent foreign material.

HEAVY GRASS MIXED CLASS

United States No. 1 Heavy Grass Mixed.—Shall be a mixture of timothy hay with not more than 60 per cent other grases, 10 per cent clover, and 10 per cent foreign material. The timothy and other grasses shall have 50 per cent or more green color.

United States No. 2 Heavy Grass Mixed.—Shall be a mixture of timothy hay with not more than 60 per cent other grasses, 10 per cent clover, and 15 per cent foreign material. The timothy and other grasses shall have 30 per cent or more green color.

United States No. 3 Heavy Grass Mixed.—Shall be a mixture of timothy hay with not more than 60 per cent other grasses, 10 per cent clover, and 20 per cent foreign material. The timothy and other grasses shall have less than 30 per cent green color, unless the hay contains more than 15 per cent foreign material.

MIXED GRASS CLASS

United States No. 1 Mixed Grass.—Shall be hay which contains more than 60 per cent other grasses, and not more than 10 per cent clover, and 10 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have 50 per cent or more green color.

United States No. 2 Mixed Grass.—Shall be hay which contains more than 60 per cent other grasses, and not more than 10 per cent clover, and 15 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have 30 per cent or more green color.

United States No. 3 Mixed Grass.—Shall be hay which contains more than 60 per cent other grasses, and not more than 10 per cent clover, and 20 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have less than 30 per cent green color, unless the hay contains more than 15 per cent foreign material.

CLOVER GRASS MIXED CLASS

United States No. 1 Clover Grass Mixed.—Shall be hay which contains more than 10 per cent clover, more than 10 per cent other grasses, and not more than 10 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have 50 per cent or more green color and the clover a green to greenish brown color.

United States No. 2 Clover Grass Mixed.—Shall be hay which contains more than 10 per cent clover, more than 10 per cent other grasses, and not more than 15 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have 30 per cent or more green color and the clover a greenish brown to brown color.

United States No. 3 Clover Grass Mixed.—Shall be hay which contains more than 10 per cent clover, more than 10 per cent other grasses, and not more than 20 per cent foreign material, the remainder, if any, to be timothy. The timothy and other grasses shall have less than 30 per cent green color and the clover a dark brown color, unless the hay contains more than 15 per cent foreign material.

DEFINITION OF TERMS

For the purposes of these grades:

Foreign Material shall include weeds and such sedges, rushes, and other plants as are coarse and not suitable for feeding purposes; also cornstalks, stubble, chaff, and other objectionable matter which occurs naturally in hay.

Injurious Foreign Material shall include sandburs, poisonous plants, wild barley or squirrel-tail grass, and other similar matter which is injurious when fed to livestock.

Clover shall include June or medium red and alsike clover. Clover may include also not to exceed 10 per cent (of the total hay) of alfalfa, mammoth clover, crimson clover, vetches, and other legumes which have a recognized feeding value.

Other Grasses shall include redtop, orchard grass, Kentucky bluegrass, Canada bluegrass, Meadow fescue, quackgrass, and other cultivated and wild grasses, sedges, and rushes of fine or medium texture which have a recognized feeding value and which occur in timothy meadows.

Class and grade requirements for Timothy, Clover, Clover Mixed, and Grass Mixed Hays

[Tabulated and abridged]

Class requirements		Grade requirements			
			Color		
Class	Percentages in mixtures with timothy	U. S. grade	Timothy and other grasses	Clovers	Foreign material, maximum per cent
Timothy	Not over 5 per cent clover, and not over 5 per cent other grasses.	U. S. Choice	70 per cent green		5
	Not over 10 per cent clover, and not over 10 per cent other grasses.	U. S. No. 1	50 per cent green		10
		U. S. No. 2	30 per cent green		15
		U. S. No. 3	Less than 30 per cent green		20
Light Clover Mixed	Not over 30 per cent clover, and not over 10 per cent other grasses.	U. S. No. 1	50 per cent green	Green to greenish brown	10
		U. S. No. 2	30 per cent green	Greenish brown to brown	15
		U. S. No. 3	Less than 30 per cent green	Dark brown	20
Medium Clover Mixed	Not over 50 per cent clover, and not over 10 per cent other grasses.	U. S. No. 1	50 per cent green	Green to greenish brown	10
		U. S. No. 2	30 per cent green	Greenish brown to brown	15
		U. S. No. 3	Less than 30 per cent green	Dark brown	20
Heavy Clover Mixed	Not over 80 per cent clover (including foreign material), and not over 10 per cent other grasses.	U. S. No. 1	50 per cent green	Green to greenish brown	10
		U. S. No. 2	30 per cent green	Greenish brown to brown	15
		U. S. No. 3	Less than 30 per cent green	Dark brown	20
Clover	Over 80 per cent clover (including foreign material), and not over 10 per cent other grasses.	U. S. No. 1		Green to greenish brown	10
		U. S. No. 2		Greenish brown to brown	15
		U. S. No. 3		Dark brown	20
Light Grass Mixed	Not over 30 per cent other grasses, and not over 10 per cent clover.	U. S. No. 1	50 per cent green		10
		U. S. No. 2	30 per cent green		15
		U. S. No. 3	Less than 30 per cent green		20
Heavy Grass Mixed	Not over 60 per cent other grasses, and not over 10 per cent clover.	U. S. No. 1	50 per cent green		10
		U. S. No. 2	30 per cent green		15
		U. S. No. 3	Less than 30 per cent green		20
Mixed Grass	Over 60 per cent other grasses, and not over 10 per cent clover.	U. S. No. 1	50 per cent green		10
		U. S. No. 2	30 per cent green		15
		U. S. No. 3	Less than 30 per cent green		20
Clover Grass mixed	Over 10 per cent clover, and over 10 per cent other grasses.	U. S. No. 1	50 per cent green	Green to greenish brown	10
		U. S. No. 2	30 per cent green	Greenish brown to brown	15
		U. S. No. 3	Less than 30 per cent green	Dark brown	20
All Classes		U. S. Sample Grade.	Hay which has been threshed, headed, or contains more than 20 per cent foreign material, or contains any injurious foreign material, or has any objectionable odor, or is heating, hot, wet, moldy, musty, caked, or is otherwise of distinctly low quality.		